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(54) Zipper strip and packaging using it

(57) A zipper strip (10) for a reclosable bag or package (110 Figure 8) includes a male interlocking profile (12) and a female interlocking profile (14). The male interlocking profile (12) includes a male interlocking member (16) and a male web (20) coextruded therewith. In like manner, the female interlocking profile (14) includes a female interlocking member (18) and a female web (22). The male interlocking member (16) snappingly engages into the female interlocking member (18) to join the profiles (12, 14) to one another. One of the male and female webs (20, 22) is wider than the other in at least one of two directions extending outwards from the male and female interlocking members (16, 18), the greater width forming at least one flange (24, 26) extending widthwise beyond the other web. The zipper strip (10) is designed to be attached to thermoplastic sheet material (50) by sealing the at least one flange (24, 26) thereto without sealing the male and female webs (20, 22) to each other. Methods for securing the zipper strip (10) to thermoplastic sheet material, and for making packages on a horizontal form-fill-and-seal machine, are also disclosed.

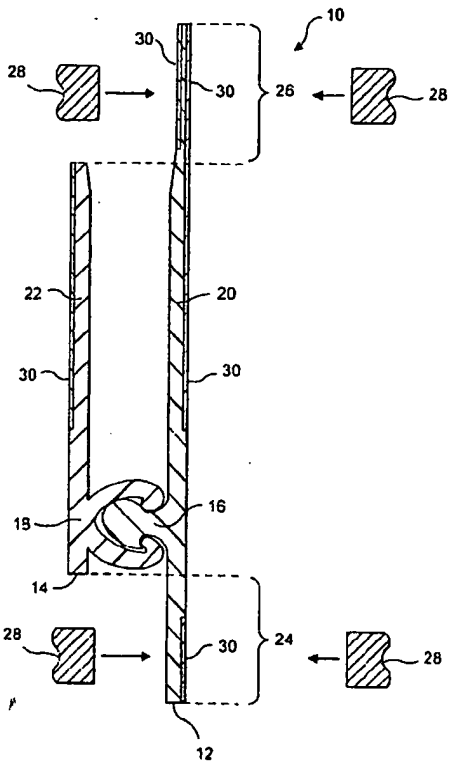

FIG. 1

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Description

The present invention relates to reclosable plastic bags of the type in which perishable food products and other goods are packaged for sale to consumers in retail outlets. More specifically, the present invention relates to reclosable plastic bags manufactured and concurrently filled on horizontal or vertical form-fill-and-seal (FFS) machines, wherein a plastic interlocking zipper for each bag is disposed transversely relative to the direction of motion of the thermoplastic sheet material used to form the reclosable bags on the FFS machine.

The present invention relates to improvements in the package-making art and may be practised in the manufacture of thermoplastic bags and packages of the kind that may be used for various consumer products, but which are particularly useful for food products which must be kept in moisture- and air-tight packages, free from leakage until initially opened for access to the product contents, which packages are then reclosable by zipper means to protect any remainder of the product therein.

The indicated art is fairly well-developed, but nevertheless remains susceptible to improvement contributing to increase efficiency and cost effectiveness.

One problem that still hampers the production of packages from continuous zipper-equipped sheet material is the difficulty in attaining a satisfactory sealing of the bag or package against leakage, where the zipper and area of film engaged by the zipper extends through the side (cross) seal areas separating one bag or package from the next. This problem occurs where the zipper is longitudinal with respect to the direction of motion of the thermoplastic sheet material used to form the reclosable bags on the FFS machine, in which case the transverse, or side, sealing bars must flatten and seal the zipper at the same time as they are sealing the thermoplastic sheet material from which the packages are being made. The difficulty with which this is consistently and successfully achieved is reflected by the high occurrence of leaking packages.

Numerous attempts have been made to solve this problem. Among the approaches that have been taken is the substitution of a transverse zipper for the longitudinal zipper. Where such a zipper is provided the transverse sealing bars associated with the FFS machine do not flatten the zipper as they are making a side seal, although they may seal the zipper to the thermoplastic sheet material transversely thereacross without flattening it.

The present invention relates to the provision of a transverse zipper for reclosable plastic bags or packages being manufactured on either a horizontal or vertical FFS machine. More specifically, the present invention is both a zipper strip and a method for securing the zipper strip transversely across the thermoplastic sheet material from which reclosable bags are being produced on a FFS machine.

According to a first aspect of this invention a zipper strip for a reclosable bag or package, said zipper strip comprising a male interlocking profile, said male interlocking profile having a male interlocking member and a male web extruded therewith; and a female interlocking profile, said female interlocking profile having a female interlocking member and a female web coextruded therewith, said male interlocking member being snappingly engagable within said female interlocking member to join said male and female interlocking profiles together,

is characterised in that said male or female web is wider than the other of the male or female web in at least one of two directions extending from said male and female interlocking members, the greater width of the wider of the male or female webs being present at least one flange extending widthwise beyond the other web, so that said zipper strip may be attached to thermoplastic sheet material by sealing said at least one flange thereto without sealing said male and female webs to one another.

In particular, the zipper strip is designed to be disposed transversely with respect to the movement through the machine of a thermoplastic sheet material used to fashion packages. The zipper strip, is attached transversely upon thermoplastic sheet material used to form the packages by sealing the at least one flange of the male or female web thereto without sealing the male and female webs to each other.

According to a second aspect of this invention a method for attaching a zipper strip transversely on a sheet of thermoplastic sheet material during the production of plastic bags or packages having transverse zippers on a form-fill-and-seal machine, said sheet being advanced in amounts equal in length to that of the bags or packages being manufactured, a length of zipper strip being attached each time said sheet is brought to rest, said method comprises the steps of:

providing a zipper strip in accordance with the first aspect of this invention having at least one flange running therealong;

disposing a length of said zipper strip transversely upon said sheet of thermoplastic sheet material, said at least one flange being in contact with said sheet and leading in the direction of the motion of said sheet; and,

sealing said at least one flange onto said sheet of thermoplastic material without sealing webs of the male and female interlocking profiles to each other.

Several specific ways of disposing the length of zipper strip onto the sheet of thermoplastic sheet material will be described below.

Finally, the present invention also comprises a method for manufacturing reclosable packages on a horizontal form-fill-and-seal machine. The method includes the step of providing a sheet of thermoplastic

sheet material having a length of zipper strip attached thereto at regularly spaced intervals as described above. A product conveyor then deposits a product to be packaged at regular intervals onto the sheet of thermoplastic sheet material. The two lateral edges of the sheet are then folded toward one another and around the product, and sealed to one another to form a tube therefrom enclosing the product. The tube is then sealed transversely to each length of zipper strip without the webs of the male and female interlocking profiles being sealed to each other. The tube is then cut transversely adjacent to each length of zipper strip to separate each completed package from the next.

Particular embodiments of the present invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a cross-sectional view of a first embodiment of zipper strip;
Figure 2 is a cross-sectional view of a second embodiment of zipper strip;
Figure 3 is a perspective view of an apparatus used to attach the zipper strip to thermoplastic sheet material;
Figure 4 is a perspective view of an alternate apparatus used for this purpose;
Figure 5 is a perspective view of still another apparatus used for this purpose;
Figure 6 is a schematic view of a horizontal FFS machine;
Figure 7 is a plan view of the thermoplastic sheet material, with lengths of zipper strip attached thereto, used to produce packages on the horizontal FFS machine; and,
Figure 8 is a simplified cross-sectional view of a package formed in a horizontal FFS machine.

Referring specifically to the figures identified above, Figure 1 is a cross-sectional view of a first embodiment of the zipper strip 10 of the present invention. The zipper strip 10 comprises a male interlocking profile 12 and a female interlocking profile 14. The male interlocking profile 12 includes a male interlocking member 16 which may have an arrowhead-shaped cross section or, as is shown in Figure 1, an asymmetrical arrowhead-shaped cross section, designed to make the zipper strip 10 easier to open from one side than from the other. The female interlocking profile 14 includes a female interlocking member 18 comprising two inwardly curving members forming a receptacle or channel into which the male interlocking member 16 may be snappingly engaged.

Both the male and female interlocking profiles 12, 14 include webs coextruded with the male and female interlocking members 16, 18. Web 20 of male interlocking profile 12, it may be observed, is wider than web 22 of female interlocking profile 14. As a consequence, web 20 has a leading flange 24 and a trailing flange 26, which together make up the amount by which web 20 is wider than web 22. As will become clear below, the leading and trailing flanges 24, 26 are so called because, when zipper strip 10 is attached to a thermoplastic sheet material being fed into an FFS machine, the leading flange 24 "leads" the transversely attached zipper strip 10 toward the machine, and the trailing flange 26 "trails" or is last. Ultimately, the leading flange 24 resides inward of the mouths of the plastic bags or packages being manufactured and concurrently filled with a consumer product on an FFS machine. While the male interlocking profile 12 is shown to have both the leading and trailing flanges 24, 26, both flanges 24, 26 could alternatively be part of the female interlocking profile 14 instead.

The zipper strip 10 is disposed transversely across thermoplastic sheet material during the manufacture of plastic bags or packages on an FFS machine. The zipper strip 10 is dispensed with male and female interlocking profiles 12, 14 joined as shown in Figure 1 onto thermoplastic sheet material with the male interlocking profile 12 resting thereupon. Heat seal bars 28 or the like, applied against the leading and trailing flanges 24, 26 as suggested by the arrows in Figure 1, seal the male interlocking profile 12 to the thermoplastic sheet material (not shown) without sealing web 22 of the female interlocking profile 14 to web 20 of the male interlocking profile 12.

Heat seal materials 30 may be applied to the outside of web 20 of male interlocking profile 12, including the outsides of the leading and trailing flanges 24, 26, as well as to the inside of the trailing flange 26 and to the outside of web 22 of the female interlocking profile 14, to facilitate their being sealed to thermoplastic sheet material. The trailing flange 26 may also be separable from the rest of web 20 by perforations.

The outsides of the leading and trailing flanges 24, 26 are attached to thermoplastic sheet material before the sheet material reaches the shoulder on a vertical FFS machine, or before the sheet material enters the FFS machine. Later, when the sheet material is folded over to form a tube with lateral edges sealed in a fin or overlap seal, the sheet material is sealed to the inside of trailing flange 26, as well as to the outsides of both webs 20, 22, without sealing the facing portions of webs 20, 22 to one another.

Figure 2 is a cross-sectional view of a second embodiment of the zipper strip 40 of the present invention. Elements common to both zipper strip 40 and zipper strip 10 described above are identified in Figure 2 using the same reference numbers. A comparison between Figures 1 and 2 indicates that zipper strip 40 lacks a trailing flange 26, but is identical to zipper strip 10 in all other respects. As was the case with zipper strip 10, zipper strip 40 is disposed transversely across thermoplastic sheet material during the manufacture of plastic bags or packages on an FFS machine. Male interlocking profile 42 rests upon the thermoplastic sheet material. Heat seal bars 28 or the like, applied against the leading flange 24, as suggested by the arrows in Figure 2, seal

the male interlocking profile 42 to the thermoplastic sheet material (not shown) without sealing web 22 of the female interlocking profile 14 to web 44 of the male interlocking profile 42. As before, while the male interlocking profile 42 is shown to have the leading flange 24, leading flange 24 could alternatively be part of the female interlocking profile 14 instead.

Both zipper strips 10, 40 shown in Figures 1 and 2, respectively, may be extruded from a polymeric resin material, such as a low-density polyethylene (LDPE). Heat seal materials 30 may be applied as shown by coextrusion or by coating following the extrusion of zipper strips 10, 40. Ethylene vinyl acetate (EVA) copolymers may be used as the heat seal materials 30.

Figure 3 is a perspective view of an apparatus used to attach zipper strip 10 to thermoplastic sheet material 50, which is conveyed in the direction of the arrows thereon toward an FFS machine. Thermoplastic sheet material 50 is moved intermittently in increments equal in length to the length of the packages being produced.

Each time the thermoplastic sheet material 50 is momentarily brought to rest, a length of zipper strip 10 is sealed transversely across the upwardly facing side thereof. Zipper tape 10 is dispensed from a roll or other supply not shown in Figure 3, and fed through a stationary clamp 52, and through a reciprocating shuttle 54, which includes a clamp 56 and a guillotine 58, the latter of which is used to cut the zipper strip 10 when required.

Shuttle 54 reciprocates each time the thermoplastic sheet material 50 is momentarily brought to rest. When shuttle 54 moves outward over thermoplastic sheet material 50, clamp 56 is closed onto zipper tape 10, while stationary clamp 52 is open, so that shuttle 54 pulls a length of the zipper tape 10 from the roll. The outward end of shuttle 54 is a probe 60, which allows the leading flange 24 and the trailing flange 26 of the zipper tape 10 to protrude from the sides thereof.

As shown in Figure 3, the shuttle 54 is in its retracted position. When in its forward position, not shown, the probe 60 extends into the space between the top sealing jaw 62 and its corresponding bottom sealing jaw 64, the latter of which is on the underside of the thermoplastic sheet material 50. The leading and trailing flanges 24, 26 extend outward from between the top and bottom sealing jaws 62, 64. When the jaws 62, 64 close, heat seal bars 28 seal the flanges 24, 26 to the thermoplastic sheet material 50. Jaws 62, 64 then are opened; guillotine 58 cuts the next length of zipper strip 10; clamp 56 is opened; and clamp 52 is closed. Then shuttle 54 retracts to the position shown in Figure 3, while thermoplastic sheet material 50 moves a length equal to the length of a package being manufactured to repeat the process.

Figure 4 is a perspective view of an alternate apparatus used to attach zipper strip 10 to thermoplastic sheet material 50. As before, thermoplastic sheet material 50 is conveyed in the direction of the arrow thereon toward an FFS machine, and is moved intermittently in increments equal in length to the length of the packages being produced.

Again, each time the thermoplastic sheet material 50 is momentarily brought to rest, a length of zipper strip 10 is sealed transversely across the upwardly facing side thereof. Zipper strip 10 is dispensed from a roll or other supply not shown in Figure 4, being pulled therefrom by a first clamp 70, which reciprocates back and forth along mechanism 74 in step with a second clamp 72. First and second clamps 70, 72 grasp leading flange 24 of zipper strip 10 to pull the zipper strip 10 transversely across the thermoplastic sheet material. Second clamp 72 holds the zipper strip 10 in position while it is being sealed to the upwardly facing side of the thermoplastic sheet material 50. A stationary guillotine 76 is used to cut the zipper strip 10 when required.

Each time the thermoplastic sheet material 50 is momentarily brought to rest, second clamp 72 brings a length of zipper strip 10 cut by stationary guillotine 76 transversely outward thereover to the position shown in Figure 4. At the same time, first clamp 70, moving in step with second clamp 72, moves a length of zipper strip 10 through guillotine 76. Top sealing jaw 62 and its corresponding bottom sealing jaw 64, the latter of which is on the underside of the thermoplastic sheet material 50, seal the leading flange 24 and the trailing flange 26 of the zipper strip 10 thereto, while the second clamp 72 holds onto the leading flange 24. Then first clamp 70 and second clamp 72 retract from the positions shown in Figure 4, the first clamp 70 retracting to a position adjacent to guillotine 76, and the second clamp 72 retracting upstream from the guillotine 76 along zipper strip 10. Thermoplastic sheet material 50 then moves a length equal to the length of a package being manufactured to repeat the process.

Figure 5 is a perspective view of another apparatus used to attach zipper strip 10 to thermoplastic sheet material 50. Thermoplastic sheet material 50 is conveyed in the direction of the arrow thereon toward an FFS machine, and, as before, is moved intermittently in increments equal in length to the length of the packages being produced.

Again, each time the thermoplastic sheet material 50 is momentarily brought to rest, a length of zipper strip 10 is sealed transversely across the upwardly facing side thereof. Zipper strip 10 is dispensed from a roll or other supply not shown in Figure 5, being pulled therefrom by a perforated belt 80 entrained about chambers 82, 84 attached to a vacuum or suction. Suction through the perforated belt 80 is used to transport the zipper strip 10. A stationary guillotine 85, through which the zipper strip 10 passes, is used to cut the zipper strip 10 when required.

Each time the thermoplastic sheet material 50 is momentarily brought to rest, perforated belt 80 draws a length of zipper strip 10 transversely across thermoplastic sheet material 50. The leading flange 24 and the trailing flange 26 of the zipper strip 10 extend beyond the

two sides of the perforated belt 80 and chamber 82, which extend into the space between the top sealing jaw 62 and its corresponding bottom sealing jaw 64, the latter of which is one the underside of the thermoplastic sheet material 50. The leading and trailing flanges 24, 26 extend outward from between the top and bottom sealing jaws 62, 64. The vacuum is turned off when the jaws 62, 64 close, heat seal bars 28 seal the flanges 24, 26 to the thermoplastic sheet material. The jaws 62, 64 are then opened, and the thermoplastic sheet material 50 is moved a length equal to the length of a package being manufactured. The vacuum is then turned on; guillotine 86 cuts the zipper strip 10; and the perforated belt 80 draws the portion of zipper strip 10 transversely across the thermoplastic sheet material 50 to repeat the process.

Any of these preceding apparatus for attaching a zipper strip 10 to thermoplastic sheet material 50 may be used in the manufacture of packages on a horizontal or vertical FFS machine. In this regard, Figure 6 is a schematic view of a horizontal apparatus. A roll 90 of thermoplastic sheet material 50 dispenses the sheet 50 intermittently in lengths equal to that of the packages being manufactured and filled. A length of zipper strip 10 is applied by the zipper applicator 92, which may include any of the three apparatus described, to the centre of the sheet material 50, as shown in Figure 7, leaving sufficient material along the two lateral edges 96 of the sheet material 50 to fold over toward one another for joining in an overlap or fin seam.

An accumulator 94 is used to convert the intermittent motion of the thermoplastic sheet material 50 to a continuous motion.

A product conveyor 98 carries the product 99 to be packaged toward the wrapping machine 100, which comprises a forming area 102, a sealing area 104, and a cross-seal area 106. In the forming area 102, the two lateral edges 96 of the sheet material 50 are folded upward and around the product. In the sealing area 104, the two lateral edges 96 are sealed to one another with a fin or lap seal to form a continuous film tube with the product and zipper strips 10 inside. In the cross-seal area, the webs of the zipper strip 10 are sealed to the sheet material 50, without sealing the webs to each other, and the packages are separated from one another along lines 112, and carried onward by the takeaway conveyor 108.

Figure 8 depicts package 110 formed in accordance with the above and containing therein the product 99. In this package the top (wide) flange 26 of one of the profiles is sealed to the portions of the film web forming the package bottom 114 as well as the package top 116. The other wide flange 24 of that profile is secured to the portions of the film web forming the package bottom 114 while the narrow flange 22 of the other profile is secured only to the portions of the film web forming the package top 116.

Claims

1. A zipper strip (10) for a reclosable bag or package, said zipper strip comprising: a male interlocking profile (12), said male interlocking profile having a male interlocking member (16) and a male web (20) extruded therewith; and a female interlocking profile (14), said female interlocking profile having a female interlocking member (18) and a female web (22) coextruded therewith, said male interlocking member (16) being snappingly engagable within said female interlocking member (18) to join said male and female interlocking profiles (12,14) together,

   characterised in that said male or female web (20 or 22) is wider than the other of the male or female web (20 or 22) in at least one of two directions extending from said male and female interlocking members (16, 18), the greater width of the wider of the male or female webs (20, 22) being present at least one flange extending widthwise beyond the other web, so that said zipper strip (10) may be attached to thermoplastic sheet material by sealing said at least one flange (24, 26) thereto without sealing said male and female webs (20, 22) to one another.

2. A zipper strip as claimed in claim 1, wherein the wider of the male and female webs (20, 22) is wider than the other in only one of said two directions extending from said male and female interlocking members (20, 22), the greater width of the wider of the webs (20, 22) being a flange (24) extending beyond the other of the webs in said one of said two directions.

3. A zipper strip as claimed in claim 1, wherein the wider one of said male and female webs (20, 22) is wider than the other in both, of said two directions extending from said male and female interlocking members (16, 18), the greater width of the wider of said male and female webs (20, 22) being present as two flanges (24, 26) extending beyond the other of the webs (20, 22) in opposite directions from said male and female interlocking members (16, 18).

4. A method for attaching a zipper strip (10) transversely on a sheet of thermoplastic sheet material (50) during the production of plastic bags or packages (110) having transverse zippers on a form-fill-and-seal machine, said sheet (50) being advanced in amounts equal in length to that of the bags or packages (110) being manufactured, a length of zipper strip (10) being attached each time said sheet (50) is brought to rest, said method comprising the steps of:

   providing a zipper strip (10) in accordance with

any one of the preceding claims having at least one flange (24, 26) running therealong;
disposing a length of said zipper strip (10) transversely upon said sheet of thermoplastic sheet material (50), said at least one flange (24, 26) being in contact with said sheet (50) and leading in the direction of the motion of said sheet; and,
sealing said at least one flange (24, 26) onto said sheet (50) of thermoplastic material without sealing webs (20, 22) of the male and female interlocking profiles (12, 14) to each other.

5. A method as claimed in claim 4, wherein the step of disposing a length of said zipper strip (10) transversely upon said sheet of thermoplastic sheet material (50) is performed by a reciprocating shuttle (60) having a clamp (56) and a guillotine (58), said clamp being provided to pull said zipper strip (10) from a supply transversely onto said sheet (50), and said guillotine (58) being provided to cut said length of said zipper strip (10).

6. A method as claimed in claim 4, wherein the step of disposing a length of said zipper strip transversely upon said sheet of thermoplastic sheet material (50) is performed by a pair of reciprocating clamps (70, 72) separated by a stationary guillotine (76), both of said reciprocating clamps (70, 72) grasping said zipper strip (10) by said at least one flange (24, 26) thereof, one of said reciprocating clamps (72) transferring said length of zipper strip (10) cut by said guillotine (76) onto said sheet of thermoplastic sheet material (50) and holding said length during said sealing step, and the other of said reciprocating clamps (70) pulling said zipper strip (10) from a supply thereof toward said guillotine (76).

7. A method as claimed in claim 4, wherein the step of disposing a length of said zipper strip (10) transversely upon said sheet (50) of thermoplastic sheet material is performed by a vacuum conveyor means (80) and a guillotine, said vacuum conveyor means (80) pulling said zipper strip (10) from a supply thereof and placing lengths cut by said guillotine (76) onto said sheet of thermoplastic sheet material (50).

8. A method as claimed in any of claims 4, 5, 6 or 7, wherein the motion of the sheet (50) is incremental.

9. A method for attaching a zipper strip (10) transversely on a sheet of thermoplastic sheet material (50) during the production of plastic bags or packages (110) having transverse zippers on a form-fill-and-seal machine, said sheet (50) being advanced in amounts equal in length to that of the bags or packages (110) being manufactured, a length of zipper strip (10) being attached each time said sheet (50) is brought to rest, said method comprising the steps of:

providing a zipper strip (10) having interlocked male and female interlocking profiles (12, 14), one of said male and female interlocking profiles (12, 14) having a web wider than that of the other on at least one of two lateral side thereof, the greater width of the wider web being at least one flange (24, 26) running therealong;
disposing a length of said zipper strip (10) transversely upon said sheet of thermoplastic sheet material (50) , said one of said male and female interlocking profiles (12, 14) having said wider web being in contact with said sheet (50) and said at least one flange being oriented in the direction of the motion of said sheet; and,
sealing said at least one flange (24, 26) onto said sheet (50) of thermoplastic material without sealing webs (20, 22) of the male and female interlocking profiles (12, 14) to each other.

10. A method for manufacturing reclosable packages (110) on a horizontal form-fill-and-seal machine (100), said method comprising the steps of:

providing a sheet of thermoplastic sheet material (50) having at regular intervals therealong a length of zipper strip (10) attached transversely across the centre thereof and having strips without the zipper strip (10) along two lateral edges (96) thereof, said zipper strip (10) having interlocked male and female interlocking profiles (12, 14), one of said male and female interlocking profiles (12, 14) having a web wider than that of the other on at least one of two lateral sides thereof, the greater width of the wider web being present as at least one flange (24, 26) running therealong, said one of said male and female interlocking profiles (12, 14) having said wider web being attached to said sheet (50), said at least one flange (24, 26) leading in a direction of motion of said sheet (50) on said horizontal form-fill-and-seal machine, said at least one flange (22, 24) being sealed to said sheet (50) to attach said interlocked male and female interlocking profiles (12, 14) thereto;
providing a product conveyor (98) to deposit a product (99) to be packaged onto said sheet of thermoplastic sheet material (50); folding said two lateral edges (96) of said sheet of thermoplastic sheet material (50) toward one another and around said product (99); sealing said two lateral edges (96) of said sheet (50) to one another to form a tube therefrom enclosing said

product (99);
sealing said tube transversely to each said length of zipper strip (10) without sealing said webs (20, 22) of said male and female interlocking profiles (12, 14) to each other; and,
cutting said sealed tube to separate each completed package (110) from the next.

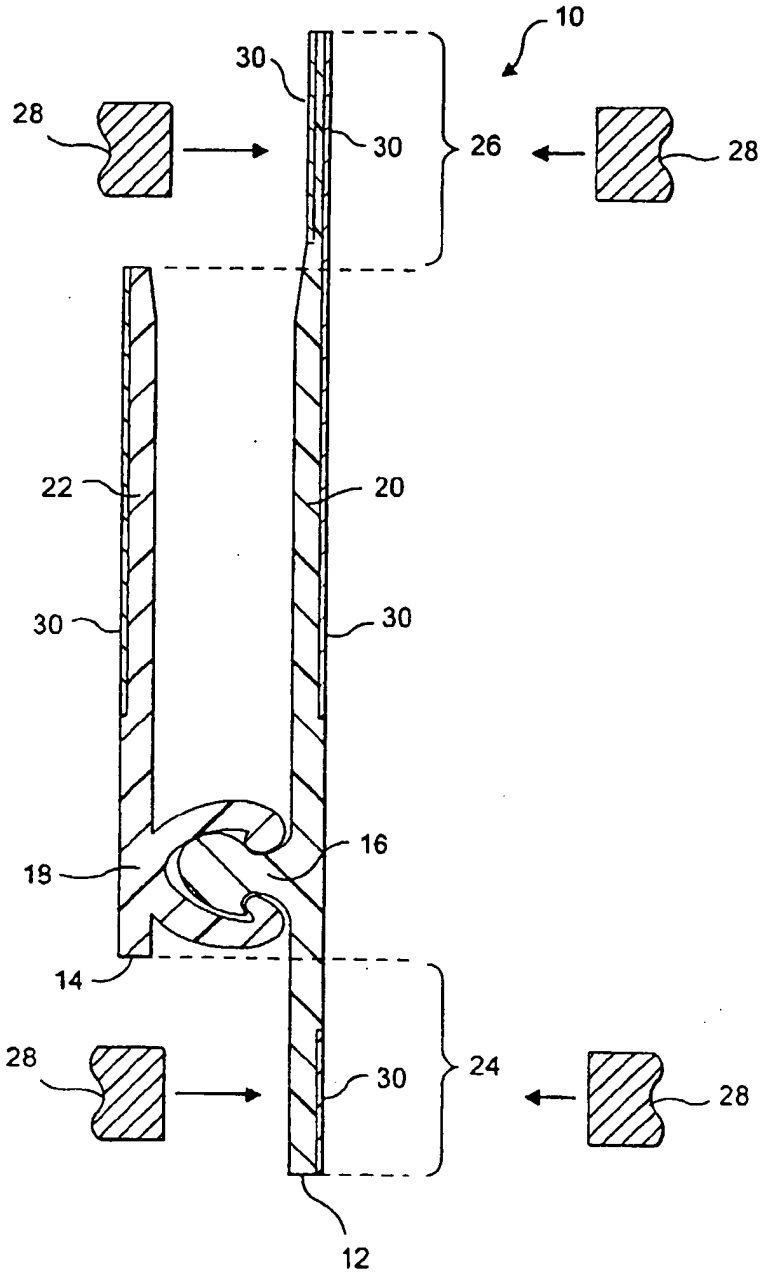

FIG. 1

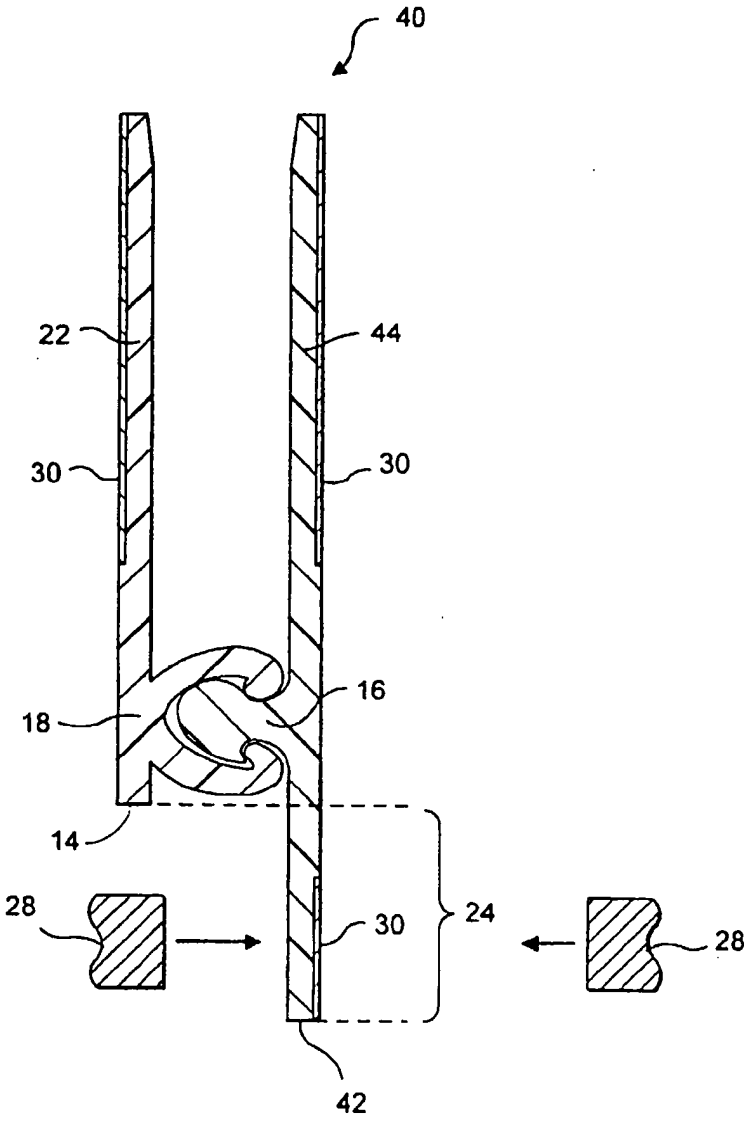

FIG. 2

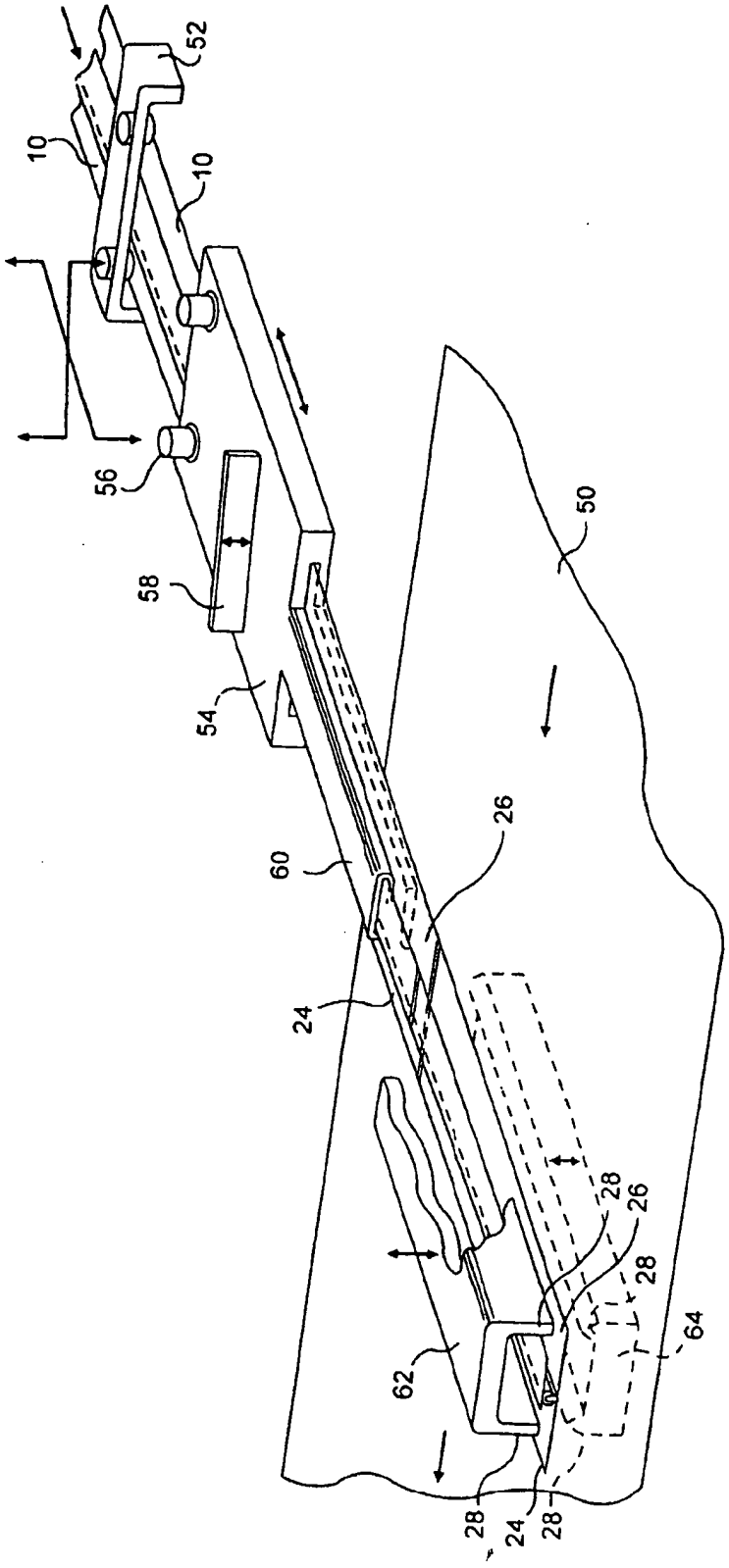

FIG. 3

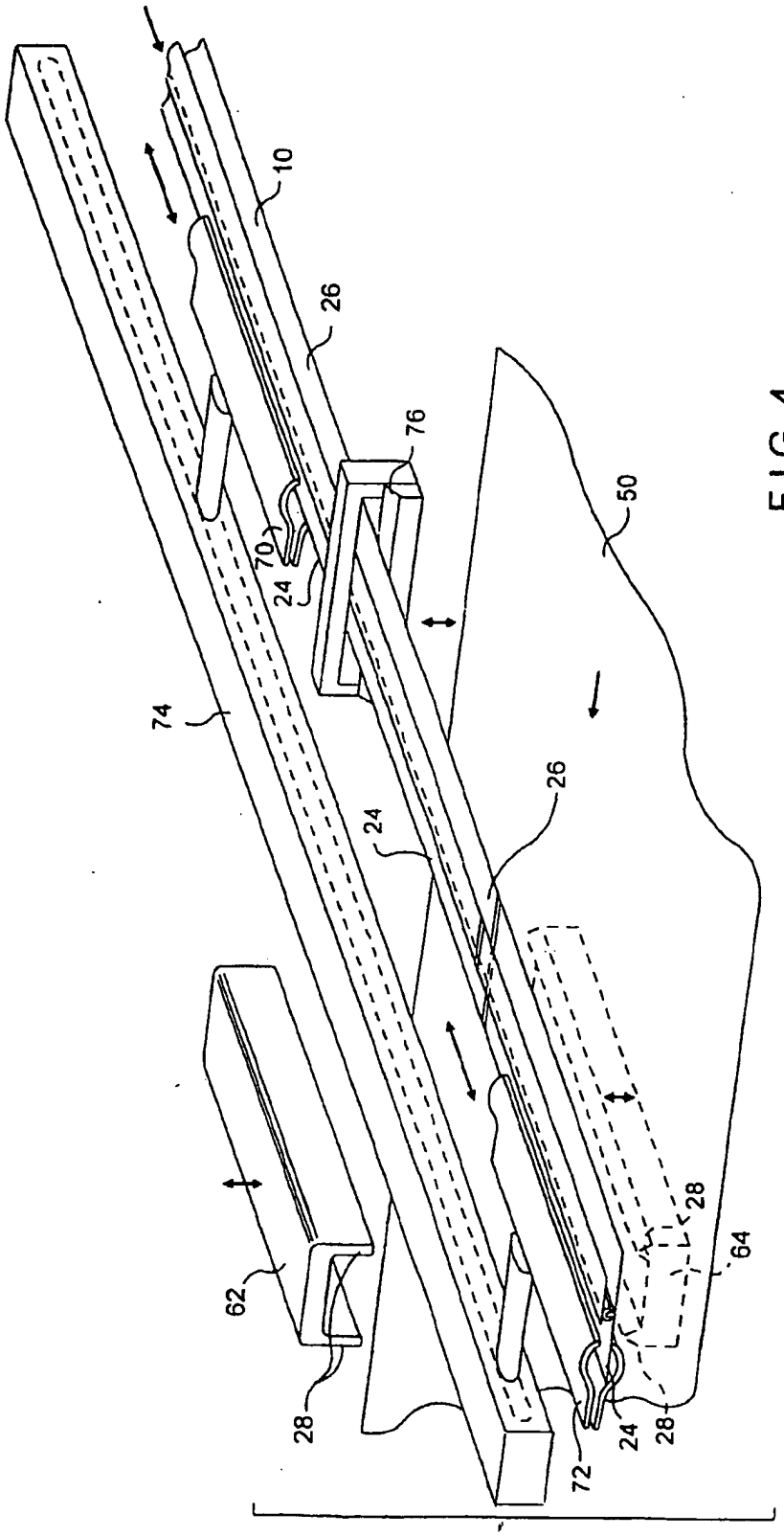

FIG. 4

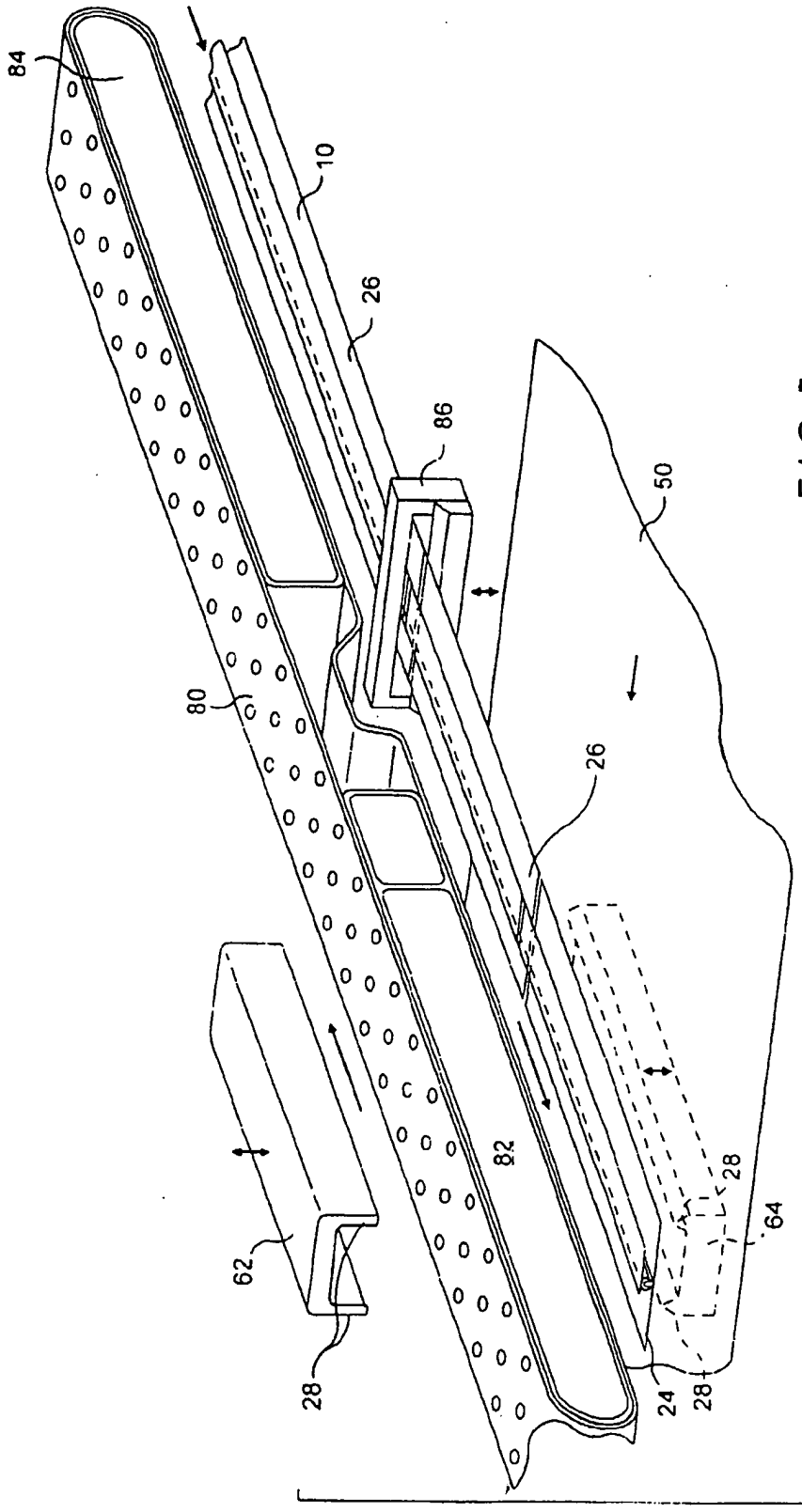

FIG. 5

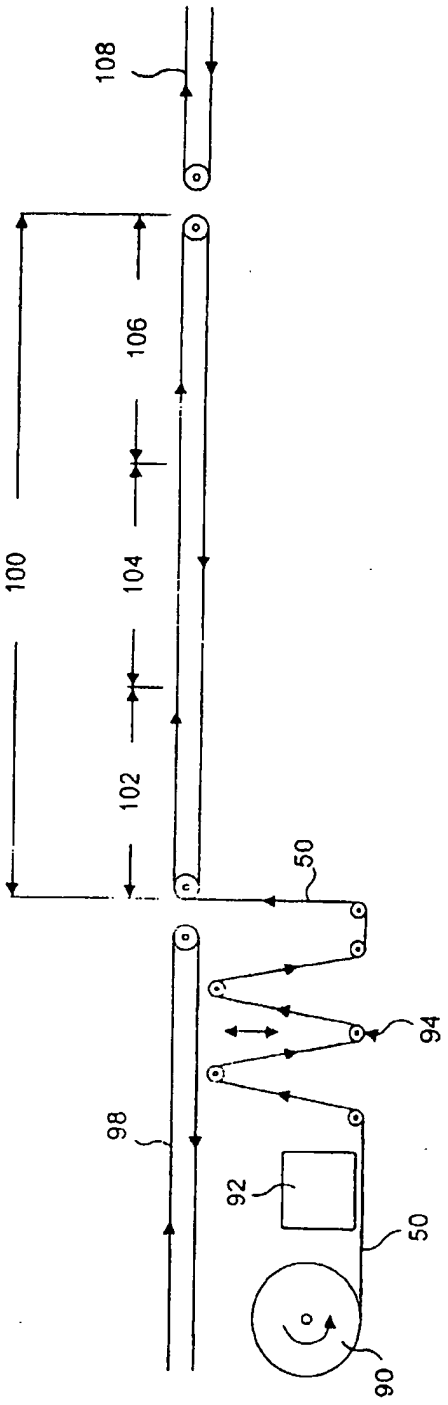

FIG. 6

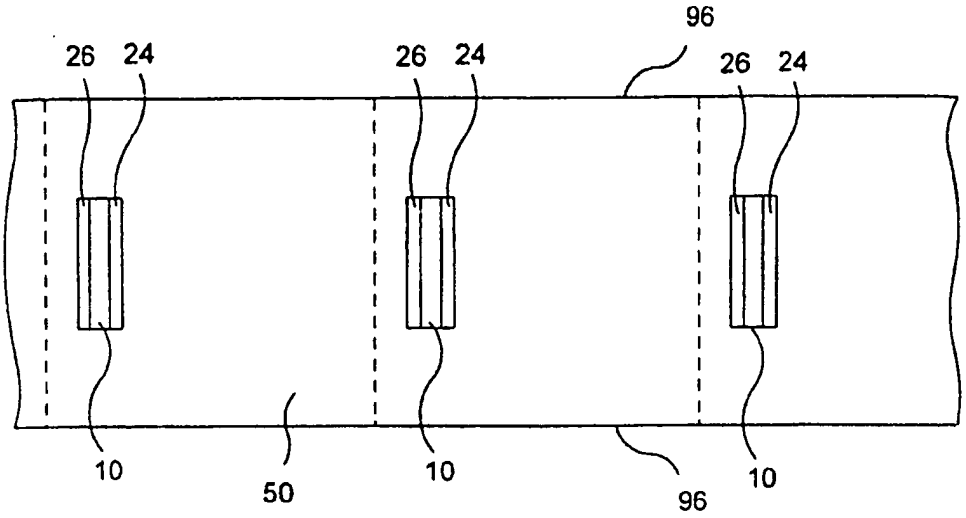
96
26
24
26
24
26
24
10
50
10
96
10

FIG. 7

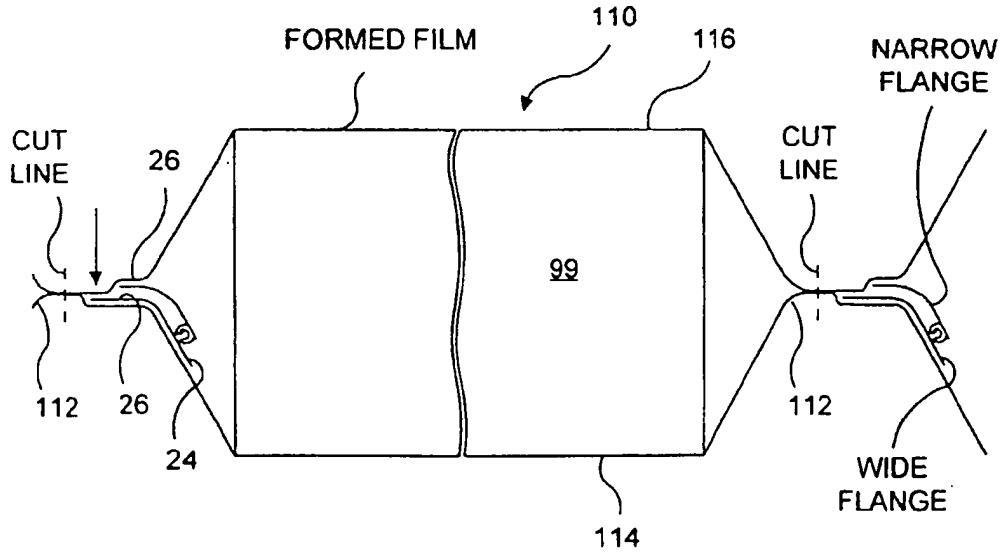
FORMED FILM
110
116
NARROW FLANGE
CUT LINE
26
CUT LINE
99
112
26
24
112
WIDE FLANGE
114

FIG. 8